IXYS

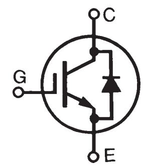
Advance Technical Information

XPT™ 600V GenX4™ w/ Diode

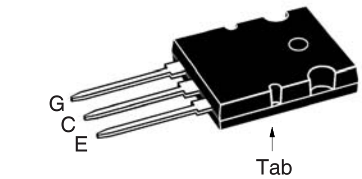
IXXK110N60B4H1 IXXX110N60B4H1

V_{CES} = 600V
I_{C100} = 110A
$V_{CE(sat)}$ ≤ 2.0V
$t_{fi(typ)}$ = 27ns

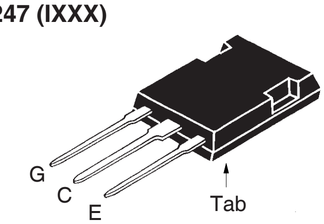
Extreme Light Punch Through
IGBT for 5-30kHz Switching



TO-264 (IXXK)



PLUS247 (IXXX)



G = Gate   E = Emitter
C = Collector   Tab = Collector

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C= 25°C (Chip Capability)	210	A
I_{LRMS}	Terminal Current Limit	160	A
I_{C100}	T_C = 100°C	110	A
I_{F110}	T_C = 110°C	50	A
I_{CM}	T_C = 25°C, 1ms	400	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 2Ω Clamped Inductive Load	I_{CM} = 220 @$V_{CE} \leq V_{CES}$	A
t_{sc} **(SCSOA)**	V_{GE}= 15V, V_{CE} = 360V, T_J = 150°C R_G = 82Ω, Non Repetitive	10	μs
P_C	T_C = 25°C	695	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
M_d	Mounting Torque (TO-264)	1.13/10	Nm/lb.in.
F_C	Mounting Force (PLUS247)	20..120 /4.5..27	N/lb.
Weight	TO-264 PLUS247	10 6	g g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250μA, V_{GE} = 0V	600			V
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}	4.0		6.5	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			50	μA
	T_J = 125°C			4	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 110A, V_{GE} = 15V, Note 1		1.70	2.00	V
	T_J = 150°C		2.18		V

Features

- Optimized for 5-30kHz Switching
- Square RBSOA
- Short Circuit Capability
- Anti-Parallel Ultra Fast Diode
- High Current Handling Capability
- International Standard Packages

Advantages

- High Power Density
- Low Gate Drive Requirement

Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 60A, V_{CE} = 10V, Note 1	24	40		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		3800		pF
C_{oes}			440		pF
C_{res}			130		pF
Q_g	I_C = 110A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		173		nC
Q_{ge}			32		nC
Q_{gc}			70		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		40		ns
t_{ri}	I_C = 55A, V_{GE} = 15V		48		ns
E_{on}	V_{CE} = 360V, R_G = 2Ω		1.6		mJ
$t_{d(off)}$	Note 2		140		ns
t_{fi}			27		ns
E_{off}			0.8	1.3	mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		35		ns
t_{ri}	I_C = 55A, V_{GE} = 15V		46		ns
E_{on}	V_{CE} = 360V, R_G = 2Ω		2.5		mJ
$t_{d(off)}$	Note 2		140		ns
t_{fi}			110		ns
E_{off}			1.0		mJ
R_{thJC}				0.18	°C/W
R_{thCS}			0.15		°C/W

Reverse Sonic (FRD)

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
V_F	I_F = 100A, V_{GE} = 0V, Note 1		1.7	2.0	V
	T_J = 150°C		1.8		V
I_{RM}	I_F = 100A, V_{GE} = 0V, T_J = 150°C		95		A
t_{rr}	$-di_F/dt$ = 1500A/μs, V_R = 300V		100		ns
R_{thJC}				0.42	°C/W

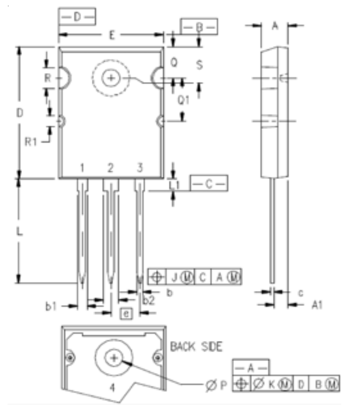
Notes:

1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher V_{CE}(clamp), T_J or R_G.

ADVANCE TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

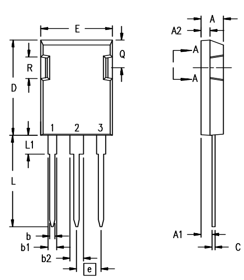
TO-264 Outline



Terminals: 1 = Gate
2,4 = Collector
3 = Emitter

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.185	.209	4.70	5.31
A1	.102	.118	2.59	3.00
b	.037	.055	0.94	1.40
b1	.087	.102	2.21	2.59
b2	.110	.126	2.79	3.20
c	.017	.029	0.43	0.74
D	1.007	1.047	25.58	26.59
E	.760	.799	19.30	20.29
e	.215BSC		5.46 BSC	
J	.000	.010	0.00	0.25
K	.000	.010	0.00	0.25
L	.779	.842	19.79	21.39
L1	.087	.102	2.21	2.59
ØP	.122	.138	3.10	3.51
Q	.240	.256	6.10	6.50
Q1	.330	.346	8.38	8.79
ØR	.155	.187	3.94	4.75
ØR1	.085	.093	2.16	2.36
S	.243	.253	6.17	6.43

PLUS247™ Outline



Terminals: 1 - Gate
2 - Collector
3 - Emitter

Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.83	5.21	.190	.205
A_1	2.29	2.54	.090	.100
A_2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b_1	1.91	2.13	.075	.084
b_2	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	0.244
R	4.32	4.83	.170	.190

Fig. 1. Output Characteristics @ T_J = 25ºC

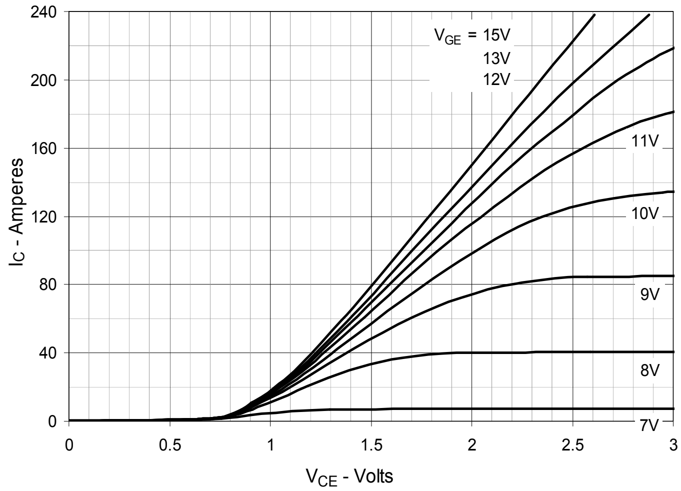


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

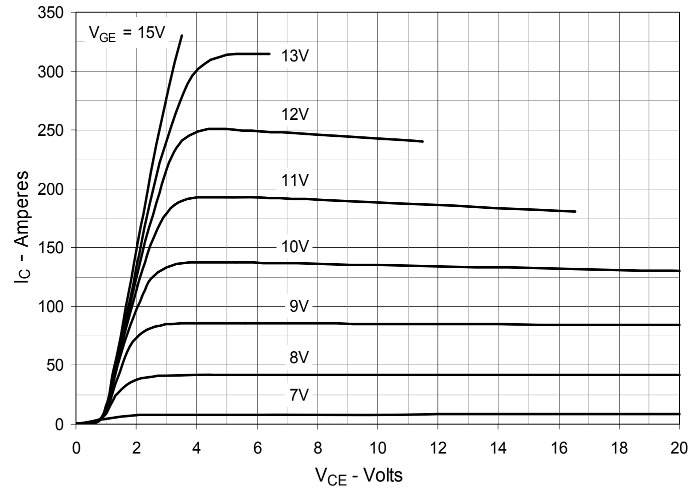


Fig. 3. Output Characteristics @ T_J = 150ºC

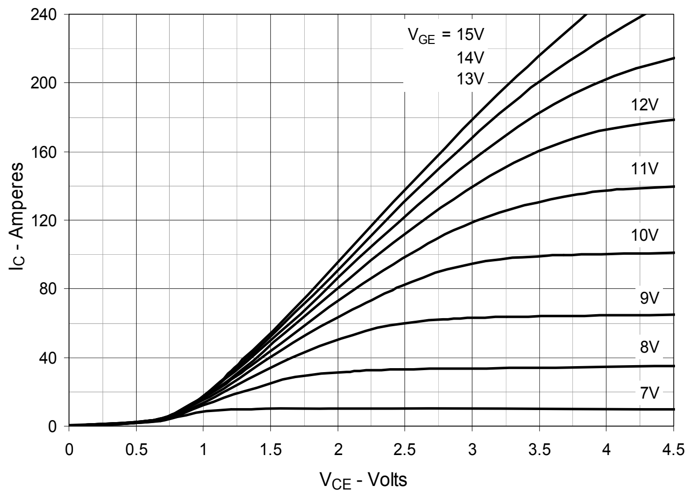


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

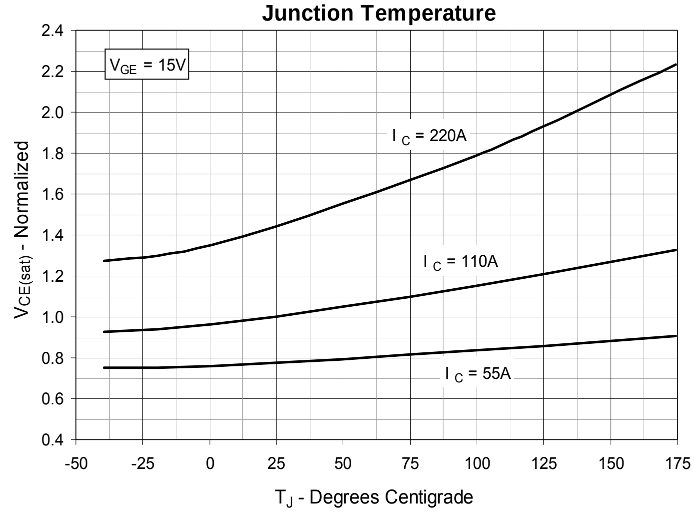


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

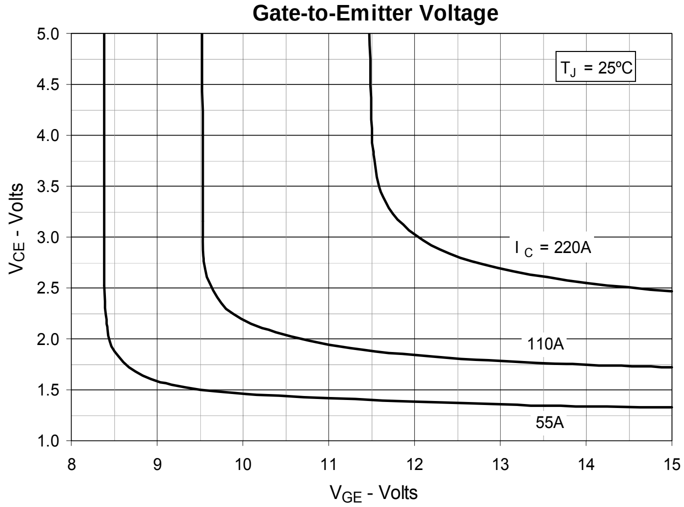


Fig. 6. Input Admittance

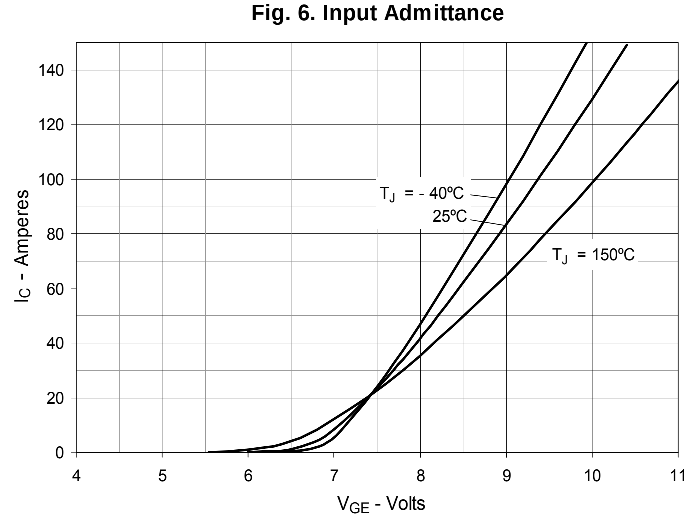


Fig. 7. Transconductance

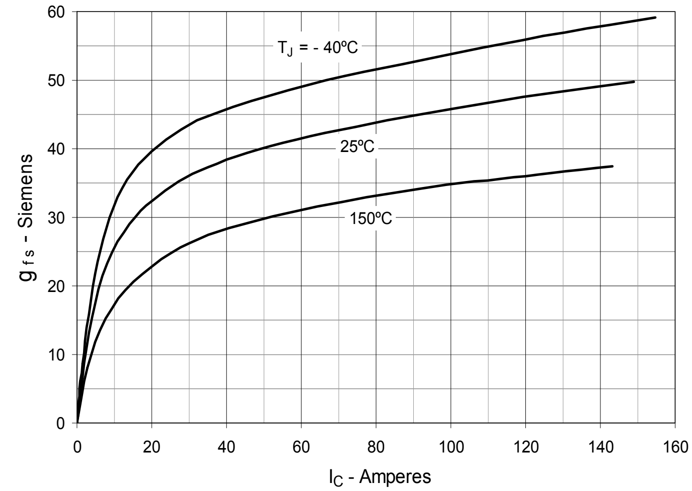


Fig. 8. Gate Charge

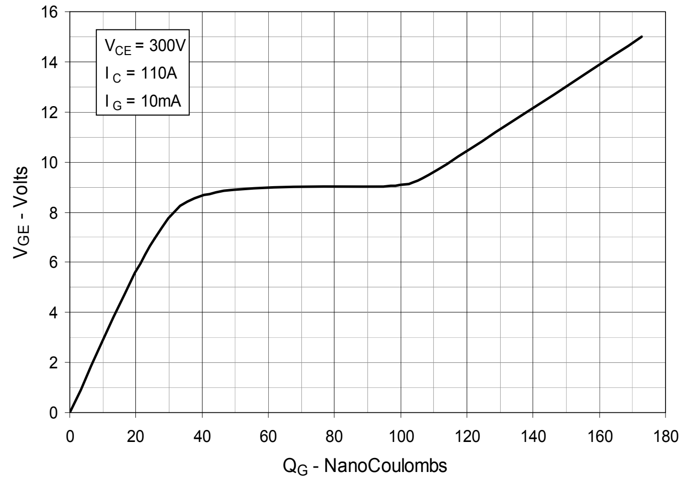


Fig. 9. Capacitance

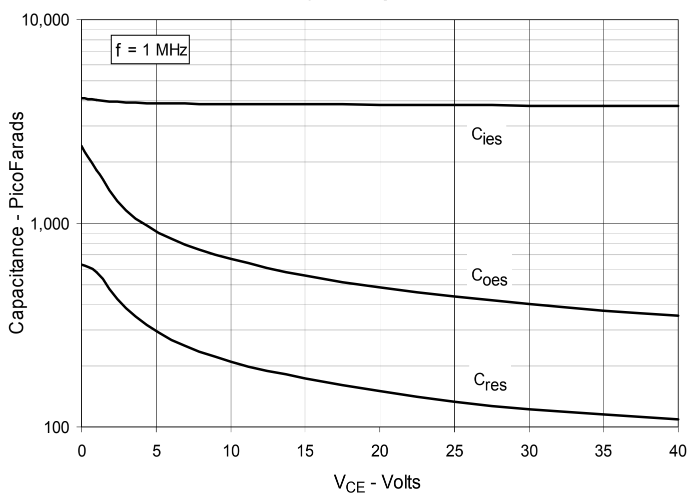


Fig. 10. Reverse-Bias Safe Operating Area

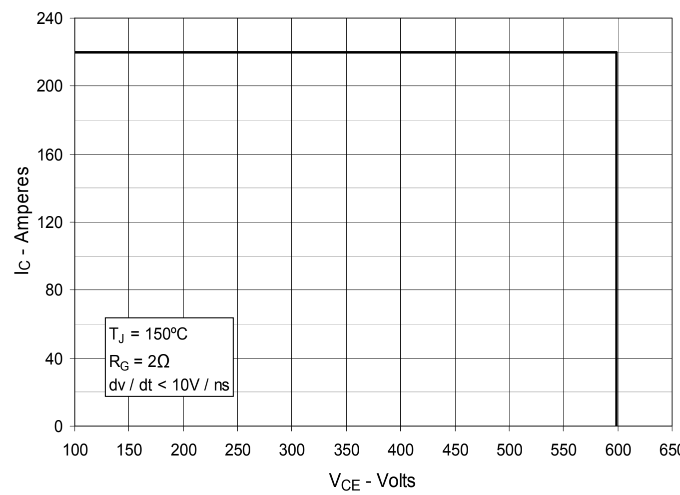


Fig. 11. Maximum Transient Thermal Impedance

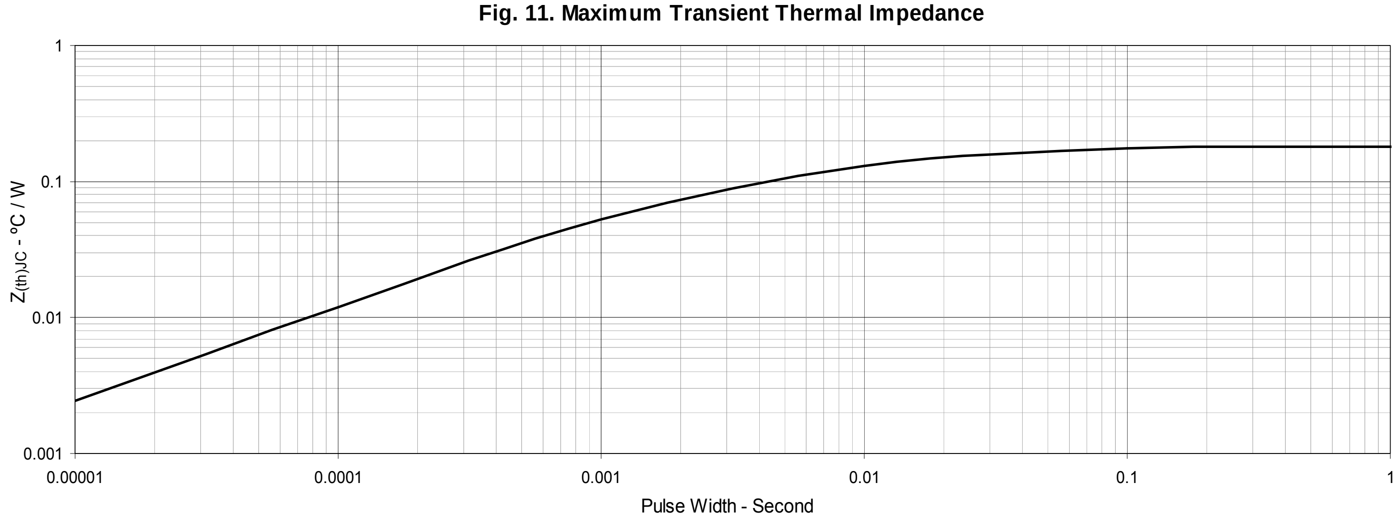


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

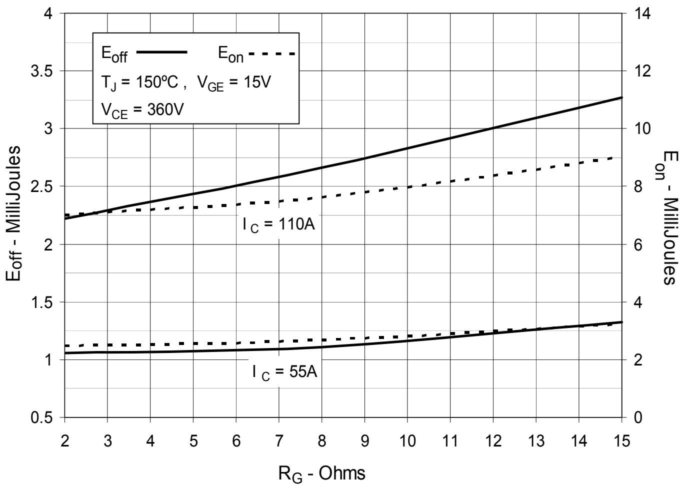


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

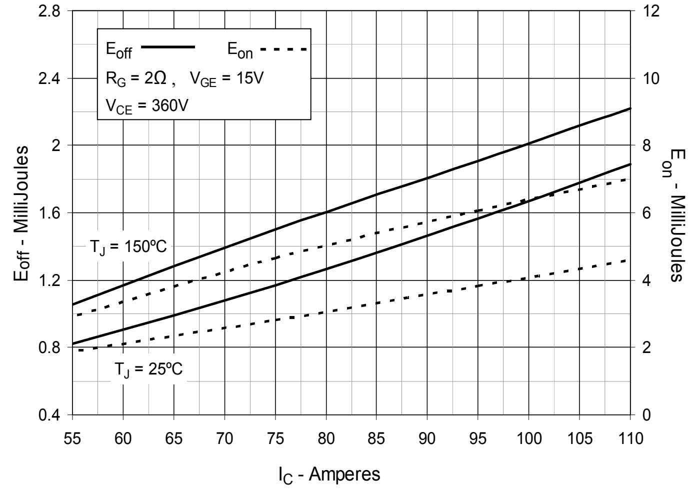


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

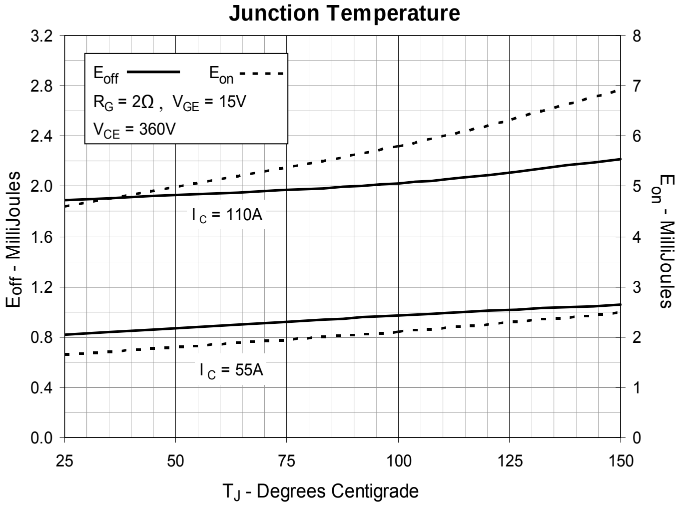


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

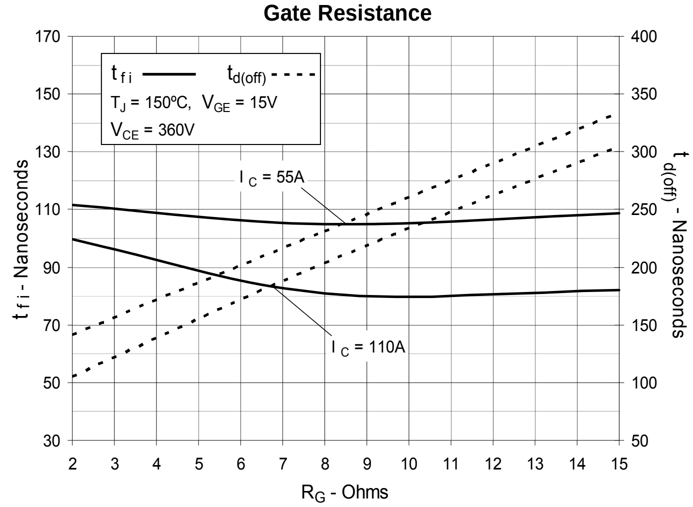


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

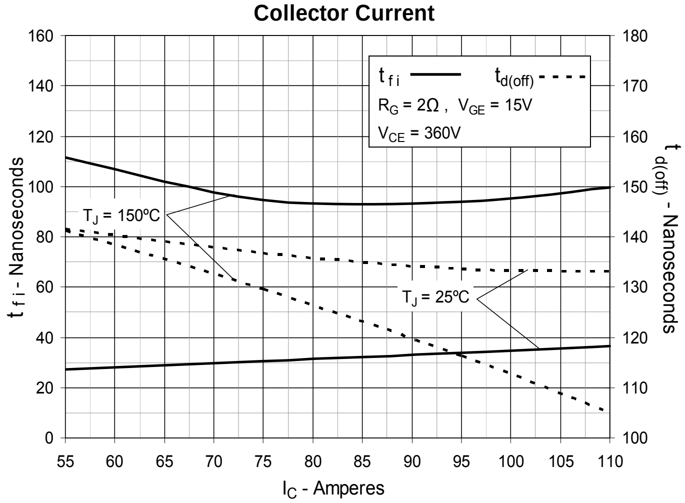


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

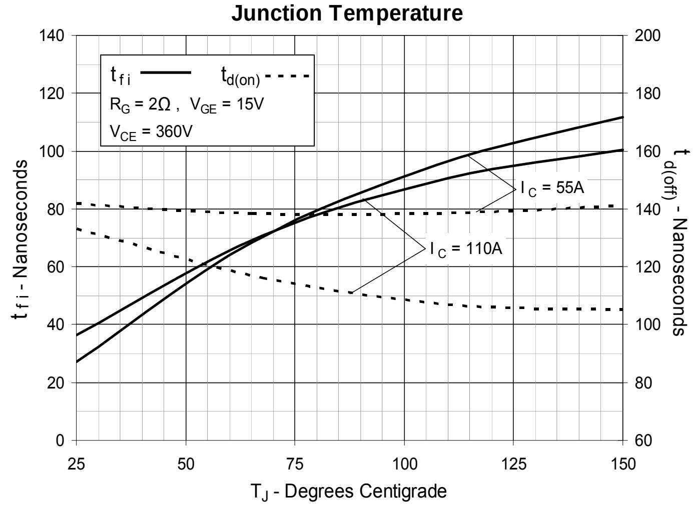


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

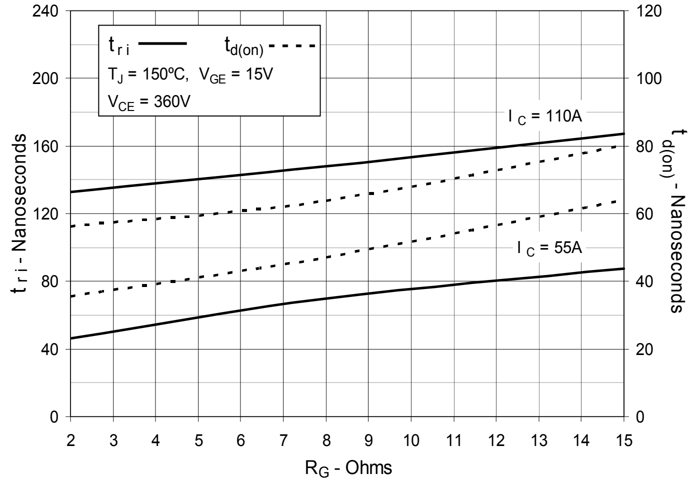


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

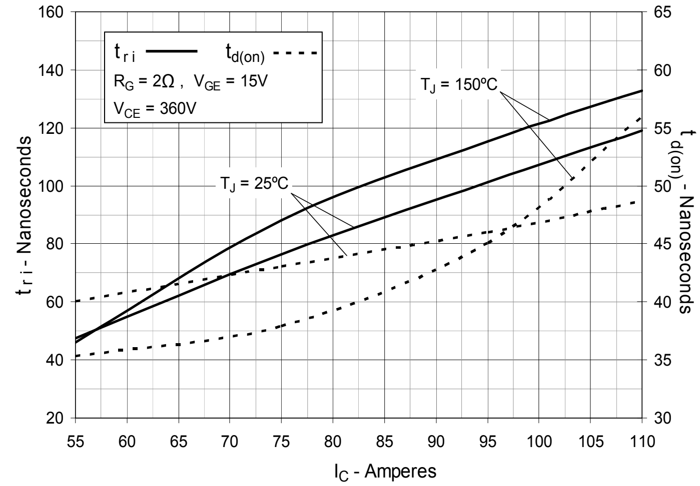
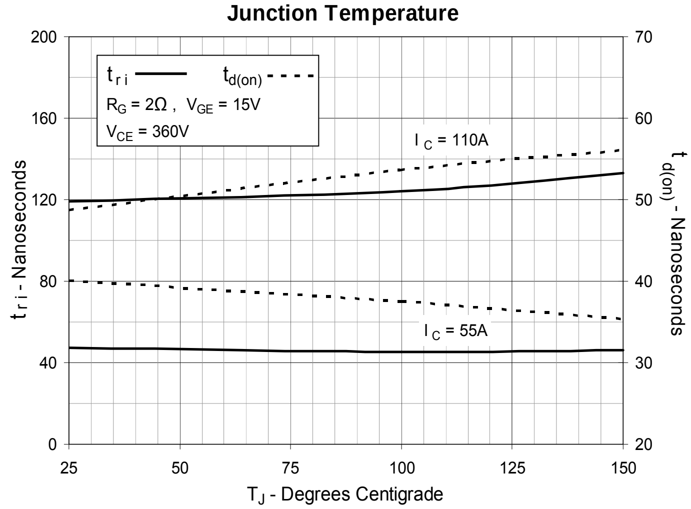


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



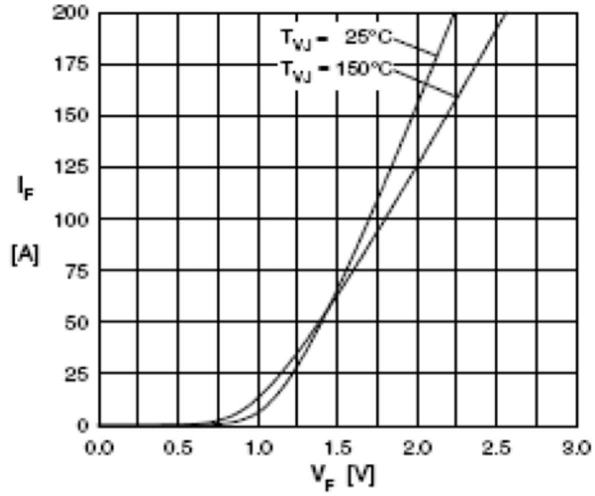


Fig. 21. Typ. forward characteristics

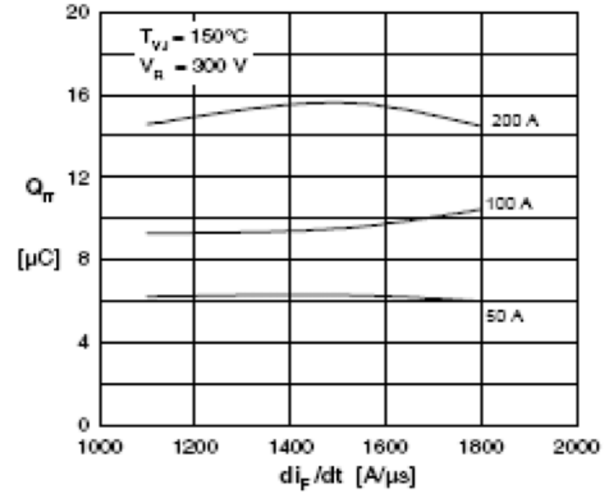


Fig. 22. Typ. reverse recovery charge Q_{rr} vs. di_F/dt

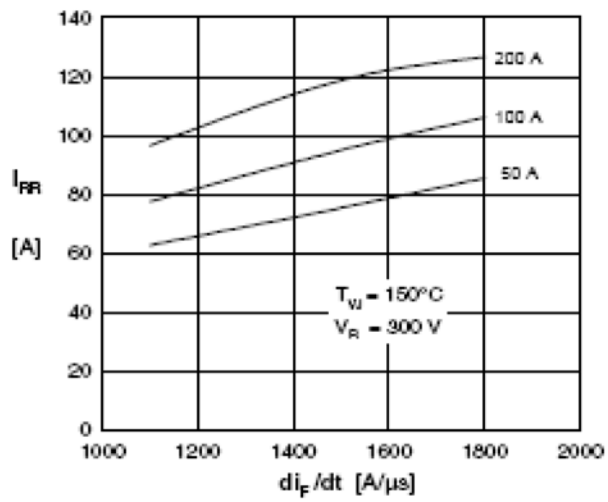


Fig. 23. Typ. peak reverse current I_{RR} vs. di_F/dt

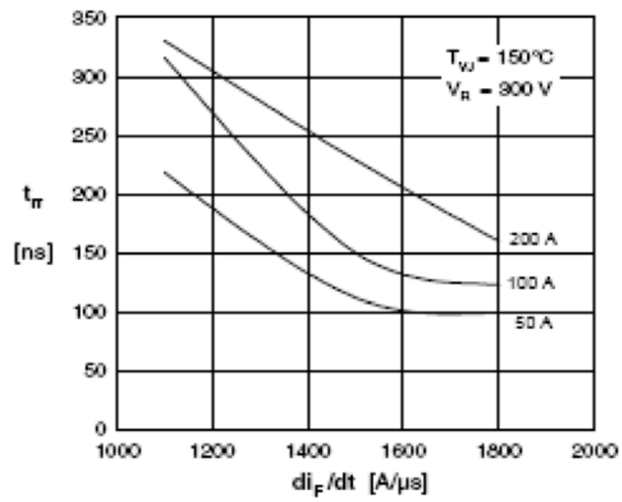


Fig. 24. Typ. recovery time t_{rr} versus di/dt

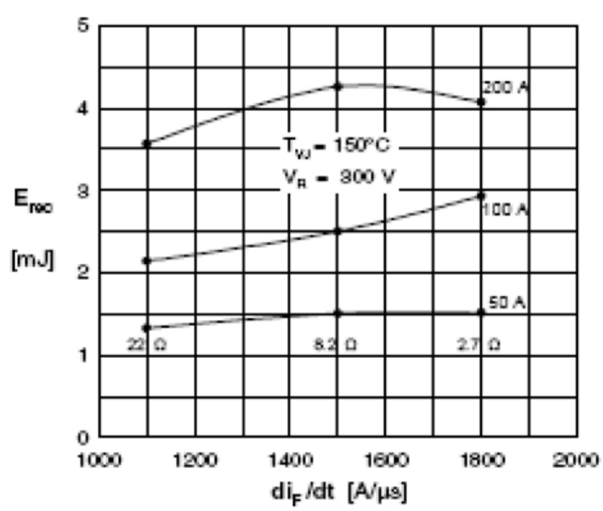


Fig. 25. Typ. recovery energy E_{rec} vs. di_F/dt